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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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20999	7590	07/01/2004	EXAMINER	
FROMMER LAWRENCE & HAUG 745 FIFTH AVENUE- 10TH FL. NEW YORK, NY 10151			BRANT, DMITRY	
			ART UNIT	PAPER NUMBER
			2655	10

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/734,228

Applicant(s)

LUCKE, HELMUT

Examiner

Dmitry Brant

Art Unit

2655

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 4/15/04.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the Office Action mailed February 3, 2004, applicant has submitted an Amendment, filed April 15, 2004, changing the drawings and amending the Specification to correct informalities to overcome examiner's objections.

While this has led to withdrawal of the objections to the Specification and the Drawings, the 35 USC 102 and 103 claim rejections remain, for the reasons given below under Response to Arguments.

Response to Arguments

2. Applicant's arguments have been fully considered but they are not persuasive.

As per claims 1-12, Applicant argues that the method disclosed in claim 1 is distinct from Jiang et al.'s method. Specifically, Applicant teaches "... **(2) determining words or combinations of words, which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase, by using and evaluating additional and paired and/or higher order information between sub-phrases ...**", where Juang et al. teach the use of a N-gram (trigram) model "**that determines the probability of a sequence of words based on the combined probabilities of three-word segments of the sequence.**"

However, the preceding part of claim 1 states that a seeded sub-phrase can be at least a sub-word or a word. Therefore, if the Examiner interpreted claim 1 using the

broadest possible meaning, it would read as: "(2) determining words, which are consistent with said seed word ... which is contained in said received speech phrase, by using and evaluating additional and paired and/or higher order information between words." This is exactly what a N-gram (trigram in Jiang et al.) model does: it starts out with a word and places additional words around the original word based on the conditional probabilities of such words occurring in a sequence. Since the evaluation of conditional probabilities of word-combinations inherently requires using additional and paired information between words for determination of conditional probabilities (these probabilities are usually derived from large word sets and grammar rules), Jiang et al.' method "reads on" claim 1.

In addition, the Examiner respectfully disagrees with the Applicant's argument stating that Jiang et al.'s method takes a "sequence of words and tries to match the sequence to the sequence found in the language model" (page 10). In fact, Jiang et al. teach that a language model provides a set of likelihoods that a particular sequence of words will appear in the language of interest. (Col. 4, 33-35). Therefore, the language model evaluates a sequence of words using conditional probabilities of such words occurring together, as opposed to trying to match a sequence of words to a template (as claimed by the Applicant). As it is well-known in the art, the probability of a N-gram is evaluated as $P_{total} = P_1 * P_2 * \dots P_n$, where P_i is a conditional probability of a word occurring, given the previous words in the sequences. Therefore, the evaluation of such likelihood is not as computationally expensive as template matching, because the individual probabilities are pre-computed ahead of time during the model training

process. To illustrate this distinction, the Examiner included a copy of the chapter discussing N-grams from a textbook titled "Speech Synthesis and Recognition." (See pages 196-197)

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-5 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Jiang et al. (6,539,353)

As per claim 1, Jiang discloses a method for recognizing speech, comprising:

- a) the steps of receiving a speech phrase (**100, FIG. 2**);
 - b) generating a signal being representative to said speech phrase using A/D converter (**102, FIG.2**);
- using feature extractor for pre-processing and storing said signal (**104, FIG. 2**);
- generating from said pre-processed signal at least one series of hypothesis speech elements (**Col. 1, line 51-53**);

c) determining at least one series of words being most probable to correspond to said speech phrase by applying a predefined language model to at least said series of hypothesis speech elements (**Col. 4, lines 13-16**) , wherein the step of determining said series of words further comprises the steps of:

identifying a hypothesis string consisting of sub-word units; (**Col. 1, lines 52-55**)

then continuing determining words or combinations of words and which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase by using and evaluating additional and paired and/or higher order information between the sub-phrases, thereby decreasing the burden of searching. (**Col. 4, lines 33-44**) - inherently, N-gram method uses conditional probabilities which are derived based on additional and paired information.

As per claim 2, Jiang et al. disclose the use of a language model (**110, FIG. 2**) to provide additional information about the set of probabilities that a particular sequence of words will appear in the language of interest (**Col. 4, lines 33-44**)

As per claim 3, Jiang et al. disclose the use of lexicon (**108, FIG. 2**) to further limit the possibilities of word grouping when using the acoustic model (**Col. 4, lines 24-28**) .

As per claims 4 and 5, Jiang et al. disclose that language model (**110, FIG. 2**) is a compact trigram model that determines the probability of sequence of words based on the combined probabilities of three-word segment of the sequence. (**Col.4, lines 41-44**).

Inherently, trigram language models take prepositional relationships of sub-phrases into account when calculating probabilities.

As per claim 9, Jiang et al. disclose the use of Hidden Markov Models for estimating probabilities for any sequence of sub-words generated by lexicon (Col. 4, lines 23-30).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 6-7 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (6,539,353) in view of Chou et al. (5,797,123).

As per claim 6 and 7, Jian et al. do not disclose the use of low-perplexity and high-perplexity parts in the system.

Chou et al. teaches limited vocabulary word spotting (low perplexity) with a parallel network of subword models used to model the non-keyword portions of the input

utterance (high-perplexity) (Col. 2, lines 61-65). Inherently, sub-word models contain word fragments.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang et al. as taught in Chou et al., in order to improve the speed of recognition by quickly identifying commonly-used words using low-perplexity vocabulary and then proceeding to identify the less-common words by resorting to more expansive computations.

As per claim 10, Jian et al. do not disclose the insertion of high-perplexity word classes into hypothetical graph.

Chou et al. teach the insertion of functional words and filler phrases into the detection network to improve recognition of key-phrases. (Col. 6, lines 47-56)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang et al. as taught in Chou et al., in order to handle repeating speech patterns and thus speed up the search and improve recognition.

As per claim 11, Jian et al. do not disclose the removal of candidates from the hypothetical graph.

Chou et al. teach the merging of the of the states of the key-phrase network, thus reducing its size (Col. 7, lines 40-46).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang et al. as taught in Chou et al., in order to prune the

passed nodes while doing the search through the hypothetical network and thus limit the possibility to accidentally encroach upon the beginning of another phrase.

As per claim 12, Jan et al. do not disclose restricting the remaining part of the key-phrase.

Chou et al. teach placing additional constraints on the search that inhibit impossible connections of key-phrases. (Col. 6, lines 64-65)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang et al. as taught in Chou et al., in order to improve the speed of recognition by quickly removing impossible combinations from the search graph and thus limiting the search space.

Allowable Subject Matter

7. Claim 8 is objected to as being dependent upon a rejected base claim 1, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Neither Jiang et al. nor Chou et al. teach the method for producing low-complexity grammar from conventional recognition grammar by:

- identifying and extracting word classes of high-perplexity from the conventional grammar

- generating a phonetic, phonemic and syllabic description of the high perplexity word classes, producing sub-word-unit grammars for each high-perplexity word class
- merging the sub-word-unit grammars with the remaining low-perplexity part of the conventional grammar to yield low-perplexity grammar

Conclusion

9. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dmitry Brant whose telephone number is (703) 305-8954. The examiner can normally be reached on Mon. - Fri. (8:30am - 5pm).

Application/Control Number: 09/734,228
Art Unit: 2655

Page 10

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Talivaldis Ivars Smits can be reached on (703) 306-3011. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to Tech Center 2600 receptionist whose telephone number is (703) 305- 4700.

DB
6/21/04

Nguyen Vo
6-24-04

NGUYEN T. VO
PRIMARY EXAMINER